

## THE STATUS OF THE GENUS *POLYALTHIA* BLUME (*ANNONACEÆ*) IN AFRICA

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**RÉSUMÉ :** Pendant la préparation du fascicule *Annonaceæ* pour la Flore d'Afrique orientale, l'auteur a considéré qu'il était nécessaire de créer un nouveau genre *Greenwayodendron* pour les espèces africaines rangées jusqu'à présent dans le genre *Polyalthia*: *P. Oliveri* Engl. et *P. suaveolens* Engl. et Diels. La typification de la première espèce est discutée et une nouvelle sous-espèce est proposée et décrite pour la seconde. *Unona Stuhlmannii* se révèle être un vrai *Polyalthia* pour lequel l'auteur établit la combinaison nouvelle.

**SUMMARY :** During the preparation of an account of the *Annonaceæ* for the Flora of Tropical East Africa, the author considered it necessary to erect a new genus *Greenwayodendron* for the African species formerly included in the genus *Polyalthia*, namely *P. Oliveri* Engl. and *P. suaveolens* Engl. and Diels. The typification of the former species is discussed and a new subspecies of the latter is described. *Unona Stuhlmannii* Engl. proves to be a true *Polyalthia* and the necessary new combination is made.

When OLIVER (1868) first referred an African tree to the genus *Polyalthia* he particularly noted that it did not fit well into the genus. Later, ENGLER and DIELS (1901), in their well known monograph of the African *Annonaceæ*, erected a section *Afropolyalthia* for the African species but their general description of *Polyalthia* scarcely fits the typical Asian members of the genus particularly in the description of the stamens. Since that date other workers on the family and writers of floras e.g. HUTCHINSON and DALZIEL (1927), BOUTIQUE (1951), KEAY (1954), R. E. FRIES (1959), HUTCHINSON (1964), LE THOMAS (1965) and PAIVA (1966) have accepted the African species as members of this predominantly S. E. Asian genus.

It is clear, however, that the polygamous flowers, linear stamens with very obviously compressed connective appendages and petals which remain connivent exclude the section *Afropolyalthia* from the genus; this much is immediately obvious if the generic description given by SINCLAIR (1955), who was working on typical material, is compared with those given by the writers on African material mentioned above.

A careful examination of the several thousands of specimens of Asiatic *Polyalthia* preserved at Kew has convinced me that here at least the characters of the androecium are important. Throughout the genus the stamens form a compact smoothly convex group, the thick polygonal connective appendages appearing like a pavement of blocks; the spreading petals make this easy to see in its entirety. After searching for possible affinities it was decided that a new genus is necessary.

The correct position of the genus within the family is more difficult. The classifications at present in use do little to express the extremely reticulate nature of the intergeneric affinities. Using HUTCHINSON'S 1964 classification it clearly comes into the *Unoneae-Xylopiineae* Group A and somewhere near *Cananga* Hook. f. & Thoms. In SINCLAIR'S system (1955) if the fact that the sepals are very slightly imbricate and the inner petals subvalvate is ignored it will not fit easily into any tribe although perhaps it could be forced into the *Unoneae* and once again placed near *Cananga*. In *Cananga*, however, the staminal appendages are different—the connective is thickened and covers the anthers as in the true *Unoneae* but the thickening also bears a small rugulose conical appendage. In the new genus the stamens do not have a broad uniformly flat connective appendage and the anthers are scarcely hidden. Actually the inner part of the connective ends in a short to long compressed appendage but the outer part is lower and is rather thickened and truncate just above the level of the anther top, thus forming a ledge. It is certain that when a new classification of the family is drawn up more use will have to be made of fruit and seed characters. The seed of the new genus has spinous processes from the inner layer of the testa entering the endosperm, quite distinct from the lamellæ which are found in a large number of Annonaceous genera. Similar spinous processes are to be found in *Popowia* Endl.<sup>1</sup>, *Oxandra* A. Rich., *Pseudoxandra* R. E. Fries, *Richella* A. Gray, *Cleistopholis* Engl., *Unonopsis* R. E. Fries, *Enantia* Oliv., *Orophea* Blume, *Bocageiopsis* R. E. Fries, *Onychopetalum* R. E. Fries and several others. The very flat seeds of *Cananga* have a similar arrangement but the processes are broader and apically flattened. This seed character will not, however, serve to distinguish the new genus from *Polyalthia* since, although the larger-fruited members of that genus have the endosperm narrowly divided by thin lamellæ, many of the smaller-fruited members have narrower lamellæ, a mixture of lamellæ and spines, or nothing but fine spines (e.g. the *Polyalthia glauca* (Hassk.) Børl. group). This diversity in fruit characters coupled with a diversity in petal shape but great uniformity in the androecium fits in with SINCLAIR'S statement that *Polyalthia* may be looked on as one of the central genera of the family. In many other genera, however, the fruits show remarkable uniformity in the character of the testa intrusions. It is interesting to note that if the sepals are accepted to be slightly

1. Restricted to the genotype and its allies; none of the African species referred to *Popowia* actually belongs to the genus.

imbricate and HUTCHINSON'S key to the *Uvarieæ* is used then the new genus will come near to *Oxandra*. The difference between slightly imbricate and valvate is negligible and often very difficult to see, which makes æstivation an impractical character to use in such borderline cases. The description of a new genus without making its affinities absolutely clear is not really advisable but in this case a new name is necessary for use in future local African floras and a correct placing will undoubtedly involve a complete examination and reclassification of all the genera of the family.

**GREENWAYODENDRON** Verdcourt, gen. nov.<sup>1</sup>.

A *Polyalthia* Blume floribus polygamis, appendicibus connectivorum compressis plerumque elongatis haud incrassatis et late truncatis, petalis haud late patentibus distincta; *Oxandrae* A. Rich. fortasse affinis floribus hermaphroditis pubescentibus, petalis valvatis vel subvalvatis, carpella semper 1-ovulata differt.

— *Polyalthia* sect. *Afropolyalthia* ENGL. & DIELS in ENGL. & PRANTL, Pflanzenfam. Nachtr. : 160 (1897) and in Monogr. Afrik. Pflanzen-Fam. Gatt. 6 : 41 (1901).

Arbores altæ vel frutices, indumento pilis simplicibus vel fere glabræ. Flores polygami (hermaphroditi vel masculi), solitarii vel pauci-plurifasciculati, foliis oppositi; bracteæ minutæ; bracteolæ semirotundatæ, cucullatæ, prope calycem positæ. Sepala 3, levissime imbricata, semirotundata. Petala 6, in verticillis duobus disposita, subæqualia, lanceolata vel linearia, pubescentia, basi intus triplicata, glabra; exteriora basi aperta, apice valvata; interiora subvalvata. Stamina numerosa vel in floribus hermaphroditis pauciora, linearia vel lineari-oblonga, antheris extrorsis; appendices connectivorum compressæ, breves vel ovatæ, oblongæ vel linguiformes, loculis vix occultantes, integræ vel dentatæ. Carpella 10-20, libera, linearia vel oblonga, 1-3-ovulata, stylo obsolete, stigmatibus globoso vel rhomboideo compresso obscure lobulato. Monocarpia 2-18, indehiscentia, globosa, distincte stipitata, 1-2(-3)-seminata; pericarpium sæpe glandulis rubroaurantiacis dense repletum. Semina depresso globosa, distincte rugosa, plerumque sulco æquatotiali cincta; processus strati interni testæ in endospermium penetrantes spiniformes. Species 2 Africa tropicæ incolæ.

Type species : *Greenwayodendron suaveolens* (Engl. and Diels) Verdc.

Connective appendage quite distinct, tongue-shaped or sometimes toothed; petals (0.6-)1-2.8 cm long; mericarps 1.2-1.8 cm. in diameter; young stems typically densely spreading pubescent but sometimes only sparsely adpressed pubescent or glabrous. . . . . *G. suaveolens*

Connective appendages much less distinct, very short and irregularly truncate (but still thin); petals 1-1.2 cm long; mericarps 5-8(-10) mm in diameter; young stems adpressed pubescent or glabrous. . . . *G. Oliveri*

<sup>1</sup> This genus is dedicated to Dr. P. J. GREENWAY whose work in East Africa for thirty years has added very significantly to what we know of the botany of the area.

**Greenwayodendron suaveolens** (Engl. and Diels) Verdc., *comb. nov.*

- *Polyalthia suaveolens* ENGL. and DIELS, Monogr. Alrik. Pflanzen-Fam. Gatt. **6** : 42, tab. 16, fig. B, C (1901); PELLEGRIN, Mém. Soc. Bot. Fr. **31** : 67 (1949); BOUTIQUE, Fl. Congo Belge **2** : 339 (1951); DALE and EGOELING, Indigenous Trees of Uganda, ed. 2 : 20 (1951); KEAY, Flora of W. Trop. Afr., ed. 2, **1** : 43 (1954); TISSERANT and SILLANS, Notul. Syst. **15** (3) : 354 (1958); R. E. FRIES in ENGL. & PRANTL, Nat. Pflanzenf., ed. 2, **17a**, 2 : 94 (1959); WALKER and SILLANS, Ere. Biol. **56** : 70 (1961); LE THOMAS, Adansonia, ser. 2, **5** : 452 (1965); PAIVA, Mem. Soc. Brot. **19** : 33 (1966); Esseneias Florestais do Maiombe Português-Angola no. 2 (1967) (very full account of ecology, anatomy, uses, etc., also figures and plates).
- *Polyalthia Oliveri* SENSU ENGL. and DIELS, Monogr. Alrik. Pflanzen-Fam. Gatt. **6** : 42 (1901) pro majore parte, non ENGL. sec. VERDC.
- *Polyalthia Morteihanii* DE WILD., Bull. Jard. Bot. BRUX. **4** : 384 (1914); EXELL, J. Bot. **73**, Suppl. Polypet. Add. : 5 (1953); EXELL and MENDONGA, Cons. Fl. Angol. **1** : 22 (1937).
- *Maba Gossweileri* GREVES, J. Bot. **67**, Suppl. 2 : 76 (1929).
- *Xytopia Ounga* EXELL, J. Bot. **69** : 99 (1931).
- *Polyalthia Aubrevillei* GHSQ. ex AUBREVILLE, Fl. Flor. Côte d'Ivoire, ed. 1, **1** : 114 (1936); PELLEGRIN, Mém. Soc. Bot. Fr. **31** : 67 (1949) (judging by at least some of the specimens cited).

TYPE : *Soyaux 218*, Sibange Farm, Gabon, fl. Feb. (Holotype B; isotypes K, P).

DISTRIBUTION : Widespread in W. Africa from Nigeria to Angola (Cabinda), Gabon, Central African Republic, Congo Republic and Uganda.

var. **gabonica** (Le Thomas) Verdc., *comb. nov.*

- *Polyalthia suaveolens* ENGL. and DIELS var. *gabonica* LE THOMAS, Adansonia, ser. 2, **5** : 453 (1965).

TYPE : *Le Testu 7936*, Lastoursville, Gabon (Holotype P).

var. ?

- *Polyalthia? acuminata* OLIV. in Fl. Trop. Afr. **1** : 26 (1868) quoad *Thomson 109*.
- *Polyalthia Oliveri* ENGL. in ENGL. and PRANTL, Nat. Pflanzenfam. Nachtr. zum ii-iv : 160 (1897) pro parte; ENGL. in ENGL. and DIELS, Monogr. Alrik. Pflanzen-Fam. Gatt. **6** : 42 (1901) pro parte; HUTCH. and DALZ., Fl. W. Trop. Afr. **1** : 55 (1927) pro parte; EXELL, Cat. Vase. Pl. S. Tomé : 101 (1944) pro parte; KEAY, Fl. W. Trop. Afr., ed. 2, **1** : 43 (1954) pro parte; KEAY, Onochie and STANFIELD, Nigerian Trees **1** : 42 (1960).

There is no doubt that OLIVER based his name on two different plants. *Thomson 109*, one of the syntypes, has the connective appendages of *P. suaveolens* but differs from true *P. suaveolens* in indumentum, very acuminate leaves, and also in the monocarps being rather constricted between the seeds. Several specimens have been seen from or near the syntype locality of Old Calabar and it is this plant that Keay, Onochie and Stanfield have treated as *P. Oliveri*, believing it to be the same as the plant occurring further to the west.

DISTRIBUTION : SE. Nigeria, Cameroun, S. Tomé.

subsp. **usambaricum** Verdc., *subsp. nov.*

A var. *suaveolenti* ramulis sparse appresse pubescentibus vel glabris, petalis minoribus 6 mm longis, carpellis pubescentibus differt.

— *Polyalthia Oliveri* sensu ENGL. and DIELS, Monogr. Afrk. Pflanzen-Fam. Gatt. 6 : 42 (1901) quoad *Scheffler 74* and sensu BRENNAN, Check-list of Tanganyika Trees and Shrubs : 43 (1949), non ENGL.

TYPE : *Greenway 4810*, Kwamkoro to Potwe, E. Usambaras, Tanzania, Dec. 1936 (Holotype K, isotype EA) (see below).

REFERENCE MATERIAL:

TANZANIA : Lushoto District (East Usambaras) : Between Monga and Derema, dec. 1899, *Scheffler 174* (B, K); Amani, in rain forest, 900 m., 18 Dec. 1928, *Greenway 7053* (EA, K) — tall tree with white flowers, fairly common; Amani West Forest Reserve, in evergreen rain forest, 960 m., 21 Dec. 1958, *Semsei 2834* (EA, K) — tree to 15 m. with small round fruit, common but scattered; Kwamkoro, in evergreen rain forest, 900 m., 16 Dec. 1959, *Semsei 2960* (EA, K) — tree to 12 m. with whitish-grey bark growing with *Ocotea* and *Parinari*, rare; Kwamkoro Forest Reserve, 4 Aug. 1961, *Semsei 3238* (EA, K) — small tree to 9 m. with green fruits; Kwamkoro to Sangerawe, 27 Dec. 1916, *Zimmermann* (EA, K); Kwamkoro to Potwe, in *Cephalosphaera*, *Parinari excelsa*, *Isobertinia Scheffleri* evergreen rain forest, 960 m., 31 Dec. 1936, *Greenway 4810* (K, EA) — an evergreen tree up to 45 m. tall with somewhat pendulous branches, smooth grey bark and lemon-yellow flowers; Sangerawe, Sept. 1955, *Semsei 2376* (EA, K).

Tall evergreen tree 9-45 m tall with smooth grey bark; branches pendulous; young branchlets very sparsely adpressed hairy, later glabrous, grey-brown, longitudinally rugose. Leaf-blades elliptic or elliptic-oblong, 7.5-18 cm long, 2.8-7.6 cm wide, acute or acuminate at the apex, regularly or asymmetrically cuncate at the base, mostly thin, glabrous above save for base of midrib when young, silky hairy beneath in young leaf buds but soon glabrescent save for midrib and ultimately almost entirely glabrous, midrib somewhat impressed above, prominent beneath; lateral nerves about 13, prominent beneath; venation reticulate, not very prominent; petioles 2-5 mm long, at first pubescent, later glabrous. Flowers probably polygamous (but no direct proof), leaf-opposed, solitary or in several-8-flowered fascicles on very short lateral shoots 1-2 mm long; pedicels 5-9 mm long, thickened upwards, pubescent with short brownish hairs; basal bracts very small; bracteole situated just below the calyx, 1.5 mm long, 3.5 mm wide, pubescent. Sepals more or less semi-circular, 2 mm long, 2.5 mm wide, pubescent outside, glabrous inside, persistent. Petals lemon-yellow or white, lanceolate, 6 mm long, 2.5 mm wide, rounded at the narrowed apex, widened at the base, shortly densely pubescent on both sides save at base inside. Stamens about 12 in ♀ flowers (♂ not seen), oblong, about 2 mm long, connective appendage, oblong-ovate, compressed. Carpels about 13, oblong, 1.5-2 mm long, 0.5-1 mm wide, 1-2-ovuled, compressed, adpressed pubescent; stigma rhombic or elliptic in outline, 0.5 mm long, compressed, very obscurely lobulate, pubescent along the apex, Fruiting pedicels just over 1 cm long. Monocarps 2-7 (-13?), globose, 1.3-1.6 cm in diameter,

1-2-seeded, not in any way constricted, very finely roughened, glabrous; stipes 0.5-1 cm long. Seeds straw-coloured or chestnut, depressed globose (cushion-shaped), 1.1-1.2 cm diameter, 6-7.5 mm thick, strongly rugose, with a marked circumferential furrow.

Since first discovered this tree has been mistakenly identified with *Polyalthia Oliveri* from which it clearly differs in the size of its fruits, a fact which I noted several years ago. It is closest to the unnamed variant of *P. suaveolens* equivalent to the syntype *Thomson 109* mentioned above but has larger monocarps and pubescent carpels. It was whilst making sure that this Usambara plant was not identical with anything described from Asia that it became evident that it did not belong to *Polyalthia* at all. At first it was considered to be a new species very closely allied to *G. suaveolens* but Madame LE THOMAS has convinced me that infraspecific rank is necessary. Bearing in mind the extreme geographical isolation of the population (well over 1000 km separating it from the eastern part of the main area of distribution of the genus) and a certain distinct facies subspecific rank has been adopted. The complete description has been added for comparison.

**Greenwayodendron Oliveri** (Engl.) Verdec., *comb. nov.*

- *Polyalthia?* *acuminata* OLIV. in Fl. Trop. Afr. 1 : 26 (1868), non THWAITES.
- *Polyalthia Oliveri* ENGL. in ENGL. and PRANTL, Nat. Pflanzenfam., Nachtr. zum II-IV : 160 (1897); ENGL. in ENGL. and DIELS, Monogr. Afrik. Pflanzen-Fam. Gatt. 6 : 42 (1901) pro parte (excl. icon.); HUTCH. and DALZ., Fl. W. Trop. Afr. 1 : 55 (1927) pro parte; KEAY, Fl. W. Trop. Afr., ed 2, 1 : 43 (1954) pro parte; AUBREVILLE, Fl. Côte d'Ivoire 1 : 146, pl. 42 (1959).
- *Artabotrys Oliveri* (ENGL.) ROBERTY, Bull. I.F.A.N. 15 : 1398 (1953) pro parte.

TYPE : *Mann 841*, Bagroo R., Sierra Leone (Lectotype, K).

DISTRIBUTION : Widespread in W. Africa from Sierra Leone to Ghana.

This species is unfortunately based on two syntypes which are not the same taxon. At present it is mostly assumed that *G. Oliveri* is distinguishable from *G. suaveolens* by the fact that only the latter has tongue-shaped connective appendages. An examination of *Mann 841* shows it to have short appendages but *Thomson 109* has long tongue-shaped appendages. There seems to me to be little doubt that two taxa are involved and it has been considered sensible to select *Mann 841* as the lectotype thus preserving the name for the taxon usually considered typical. *Thomson 109*, however, carries OLIVER's original drawings and notes on the floral parts and his description refers mostly to this sheet; logically there were the strongest grounds for selecting it as the lectotype. As I have pointed out above I consider this sheet represents a variant of *P. suaveolens* about which more information is needed.

Mr. F. RICHARDSON and Dr. C. R. METCALFE have kindly investigated the anatomy of two pieces of woody stem, one taken from *Polyalthia subcordata* (Blume) Blume the type species of the genus *Polyalthia*, and

the other from *Greenwayodendron suaveolens* subsp. *usambaricum*. The differences between the two are not significant and no more than one would expect to find between species of the same genus. Wood anatomy is not, however, of great value in distinguishing genera in this family. It seems worth detailing the characters actually noted.

— *P. subcordata*: cork superficial; cortex with abundant stone cells and solitary crystals; phloem stratified; outer ends of rays wedge-shaped and containing crystals; vessels in pairs, long multiples and clusters; lateral pits very small; vessel ray pits similar to lateral pits of the vessels; parenchyma next to vessels with simple elongated pits; parenchyma mostly apotracheal in uniseriate lines; rays mostly 3-5 cells wide with tails consisting of upright cells; pith containing stone cells.

— *G. suaveolens* var. *usambaricum*: cork superficial; cortex with infrequent stone cells but including idioblasts containing a brownish substance; no crystals seen in the cortex; phloem stratified containing a few solitary crystals; ray endings wedge-shaped; wood structure similar in all essentials to that of *P. subcordata* but rays mostly 5-8 cells wide; pith sclerotic.

They have also compared these two species with *Oxandra laurifolia* (Sw.) A. Rich. the type species of the genus *Oxandra* with the following results.

— *O. laurifolia*: cork superficial; cortex containing oil or tannin cells and sclereids as well as clustered and solitary crystals; phloem stratified; ray ends triangular; xylem with vessels solitary and in radial multiples of 2-8 as well as clusters; vessel pitting very fine, alternate; vessel-ray pitting similar; parenchyma banded, 1-2 cells wide; rays 1-6, mostly 3-4 cells wide, almost homogenous; pith with diaphragms of sclereids.

— *G. suaveolens* var. *usambaricum*: cork superficial; cortex containing oil or tannin cells, sclereids and a few solitary crystals; phloem stratified; ray ends triangular; xylem with vessel arrangement similar to that of *Oxandra laurifolia*; vessel pitting very fine, alternate; vessel-ray pitting similar; parenchyma banded, 1-2 cells wide but most bands uniseriate; rays 1-8 cells wide, mostly 6, composed of upright and procumbent cells; pith containing lignified cells but no diaphragms composed of sclereids.

It will be seen that the young stems are very similar to each other in their anatomy. The rays in *Oxandra* are narrower and more homogenous than those of *Greenwayodendron*. Mr. RICHARDSON pointed out the interesting fact that diaphragms consisting of sclereids are absent from the pith of *Greenwayodendron* but are present in the type species of *Polyalthia* and *Oxandra*. Without examination of further material it is not possible to assess if this is of real taxonomic significance.

There is, however, one true *Polyalthia* native to the coastal regions of East Africa, closely related to *P. korinti* (Dunal) Hook. f., and Thoms. from Ceylon, but differing in its leaf venation and other details.

***Polyalthia Stuhlmannii*** (Engl.) Verdec., *comb. nov.*

- *Unona Stuhlmannii* ENGL. in Pflanzenw. Ost-Afr. C : 179 (1895); ENGL. and DIELS, Monogr. Afrk. Pflanzen-Fam. Gatt. 6 : 41, tab. 16 A (1901); BRENNAN, Checklist of Tanganyika Trees and Shrubs : 45 (1949).
- *Polyalthia* sp., DALE and GREENWAY, Kenya Trees and Shrubs : 37 (1961).

TYPE of the species : *Stuhlmann 229*, Bagamoyo, Tanzania, Feb. 1890 (Holotype B).

OTHER MATERIAL:

KENYA : Kilifi District: Mida Forest, *Gardner 1321* (K)- shrub with green petals, vernacular name (Swahili) " Mwauga-jini "; same locality, *Baltiscombe 1011* (K)- vernacular name (Kigiriana) " Mwangajini ". Lamu District: Witu, Utwani Forest, Dec. 1956, *Rawlins 262* (EA, K)- a large undershrub found in almost pure clumps beneath *Terminalia* and *Manilkara*, up to 3.6 m. tall, much-branched, the ends of the branches inclined to droop, densely leafy, flowers fleshy, petals yellowish-green; same locality and date, *Rawlins 363 B* (EA, K). Coast, without definite locality, *Barbe-Baker 1103* (K).

TANZANIA : Tanga District: 11.2 km. NE of Pangani, Kigombe Beach, shrub layer of coastal forest, 11 July 1953, *Drummond* and *Hemsley 3238* (K)- tall shrub with arching branches, many from the same root, up to 5 m. tall, perianth green, inner members sometimes with purplish-brown area at base, stamens cream, fruits green at first, red when ripe. Uzaramo District: Fungoni Forest Reserve, 21 Oct. 1965, *Mgaza 717* (EA, K)- shrub about 4.5 m. tall with shiny leaves and grey bark.

Other species from Africa originally described in *Polyalthia* and not yet mentioned in the above account are as follows :

- *Polyalthia crassipes* Engl. in Engl., Bot. Jahrb. 39 : 477 (1907) = *Cleistopholis Staudtii* Engl. and Diels.
- *Polyalthia mayumbensis* Exell in J. Bot. Suppl. : 4 (1926) = *Xylopia Quintasii* Engl. & Diels.

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